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Die angehefteten Unterlagen stimmen mit der ursprünglich eingereichten Fassung der auf dem nächsten Blatt bezeichneten europäischen Patentanmeldung überein.

The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. Patent application No. Demande de brevet n°

03010490.5

**PRIORITY
DOCUMENT**
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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
p.o.

R C van Dijk



Anmeldung Nr:
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Demande no:

Anmeldetag:
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Anmelder/Applicant(s)/Demandeur(s):

Harman/Becker Automotive Systems GmbH
Becker-Göring-Strasse 16
76307 Karlsbad
ALLEMAGNE

Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Method for speech communication

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GRÜNECKER KINKELDEY STOCKMAIR & SCHWANHÄUSSER

ANWALTSSOZIETÄT

EPO-Munich
58

09. Mai 2003

GKS & S MAXIMILIANSTRASSE 58 D-80538 MÜNCHEN GERMANY

RECHTSANWÄLTE
LAWYERS
MÜNCHEN
DR. HELMUT EICHMANN
GERHARD BARTH
DR. ULRICH BLUMENRÖDER, LL.M.
CHRISTA NIKLAS-FALTER
DR. MAXIMILIAN KINKELDEY, LL.M.
DR. KARSTEN BRANDT
ANJA FRANKE, LL.M.
UTE STEPHANI
DR. BERND ALLEKOTTE, LL.M.
DR. ELVIRA PFRANG, LL.M.
KARIN LOCHNER
BABETT ERTLE
CHRISTINE NEUMIERL
SABINE PRÖCKNER

PATENTANWÄLTE
EUROPEAN PATENT ATTORNEYS

MÜNCHEN

DR. HERMANN KINKELDEY

PETER H. JAKOB

WOLFHARD MEISTER

HANS HILGERS

DR. HENNING MEYER-PLATH

ANNELE EHNOLD

THOMAS SCHUSTER

DR. KLARA GOLDBACH

MARTIN AUFENANGER

GOTTFRIED KLITZSCH

DR. HEIKE VOGELSGANG-WENKE

REINHARD KNAUER

DIETMAR KUHL

DR. FRANZ-JOSEF ZIMMER

BETTINA K. REICHELT

DR. ANTON K. PFAU

DR. UDO WEIGELT

RAINER BERTRAM

JENS KOCH, M.S. (U of PA) M.S.

BERND ROTHÄMEL

DR. DANIELA KINKELDEY

THOMAS W. LAUSENTHAL

DR. ANDREAS KAYSER

DR. JENS HAMMER

DR. THOMAS EICKELKAMP

JOCHEN KILCHERT

DR. THOMAS FRIEDE

PATENTANWÄLTE
EUROPEAN PATENT ATTORNEYS

BERLIN

PROF. DR. MANFRED BÖNTA

DR. PATRICK ERK, M.S. (DUT)

KÖLN

DR. MARTIN DROPMANN

CHEMNITZ

MANFRED SCHNEIDER

OF COUNSEL
PATENTANWÄLTE

AUGUST GRÜNECKER

DR. GUNTER BEZOLD

DR. WALTER LANGHOFF

DR. WILFRIED STOCKMAIR

(-1996)

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DATUM / DATE

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Applicant: Harman/Becker Automotive Systems GmbH

**Becker-Göring-Str. 16
76307 Karlsbad
Germany**

„Method for Speech Communication“

GRÜNECKER KINKELDEY
STOCKMAIR & SCHWANHÄUSSER
MAXIMILIANSTR. 58
D-80538 MÜNCHEN
GERMANY

TEL. +49 89 21 23 50
FAX (GR 3) +49 89 22 02 87
FAX (GR 4) +49 89 21 86 92 93
<http://www.gruenecker.de>
e-mail: postmaster@gruenecker.de

DEUTSCHE BANK MÜNCHEN
No. 17 51734
BLZ 700 700 10
SWIFT: DEUT DE MM

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Method for speech communication

The invention is directed to a method for speech communication, in particular, in a vehicular cabin.

It is the problem underlying the invention to provide a method improving the speech communication in a vehicle. This problem is solved by the method according to claim 1. Accordingly, a method is provided comprising

receiving input signals emanating from at least two microphone arrays each comprising at least one microphone,

processing the input signals of each microphone array, wherein a temporal and a spatial distribution of the input signals of each microphone array is determined to control an attenuation of the input signals.

According to a preferred embodiment, the step of processing the input signals comprises processing the input signals of each microphone array by a beamformer.

Further features and embodiments of the invention are explained in the following with reference to the figures.

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Claims

1. Method comprising:

receiving input signals emanating from at least two microphone arrays each comprising at least one microphone,

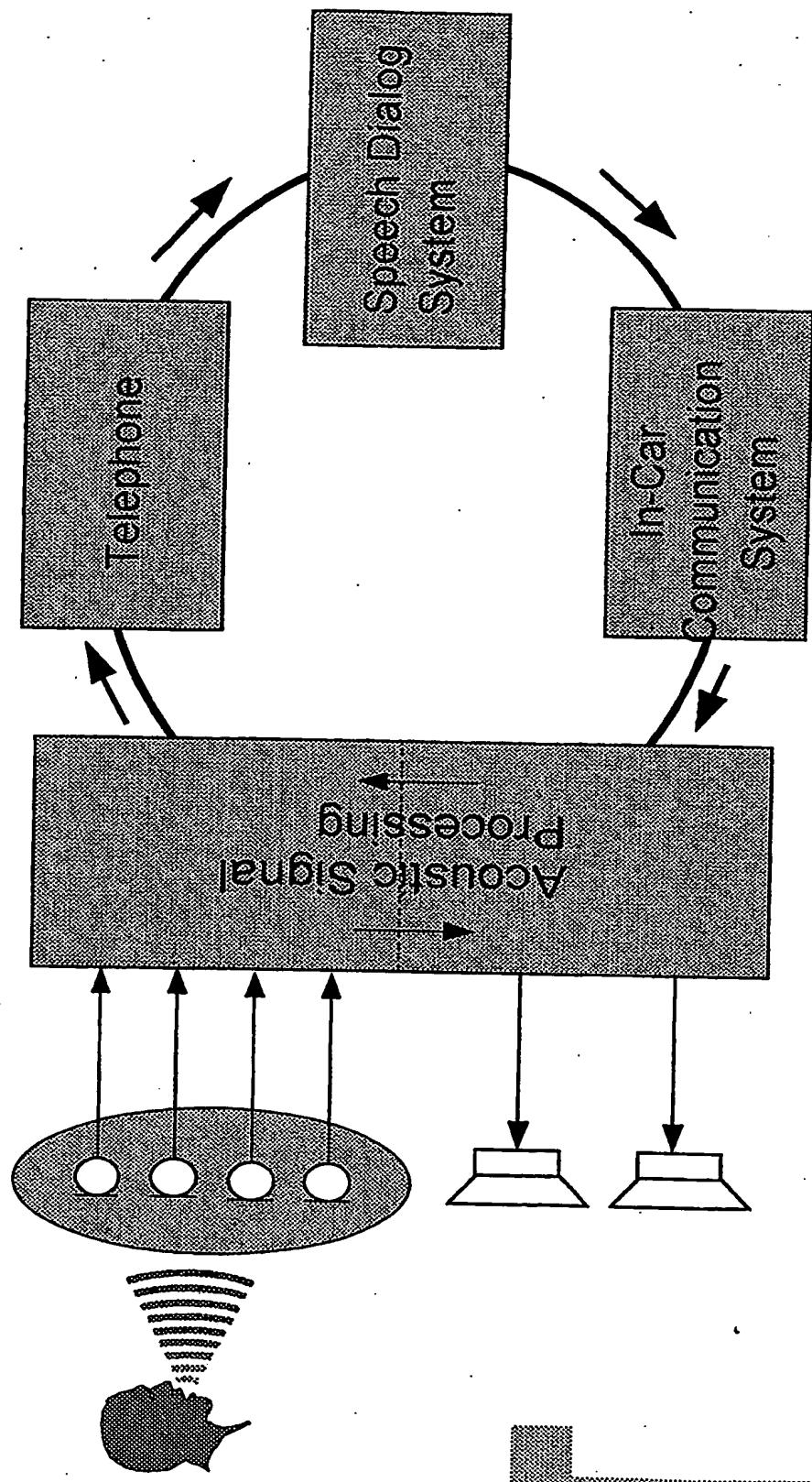
processing the input signals of each microphone array, wherein a temporal and a spatial distribution of the input signals of each microphone array is determined to control an attenuation of the input signals.

2. Method according to claim 1, wherein processing the input signals comprises processing the input signals of each microphone array by a beamformer.

System Overview

TEMIC
Speech Dialog Systems

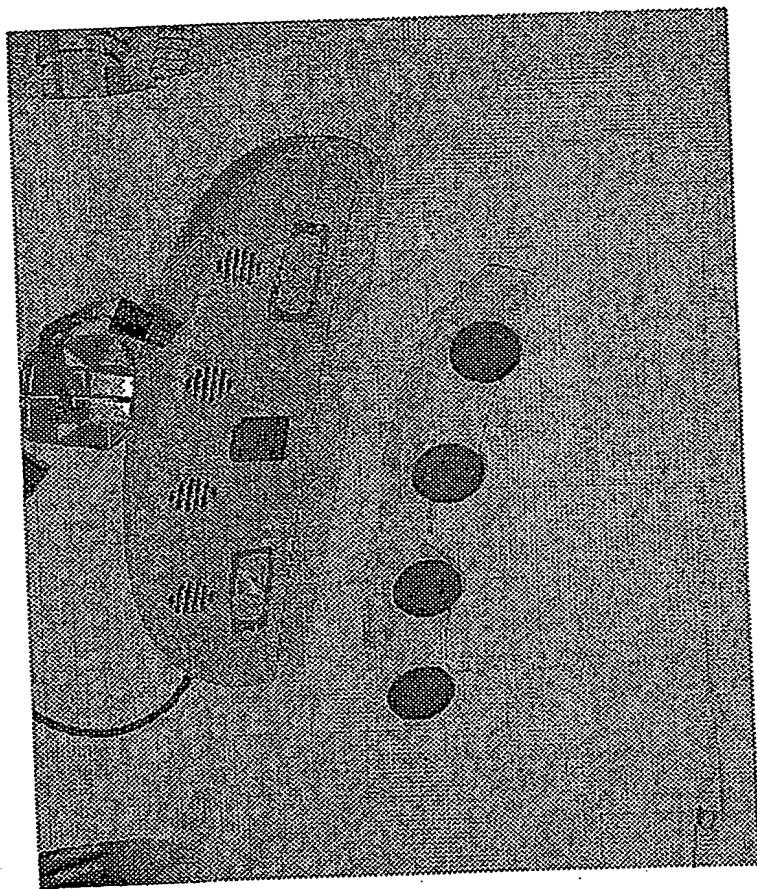
Integrated hands-free communication system



StarTrace

Microphone Array

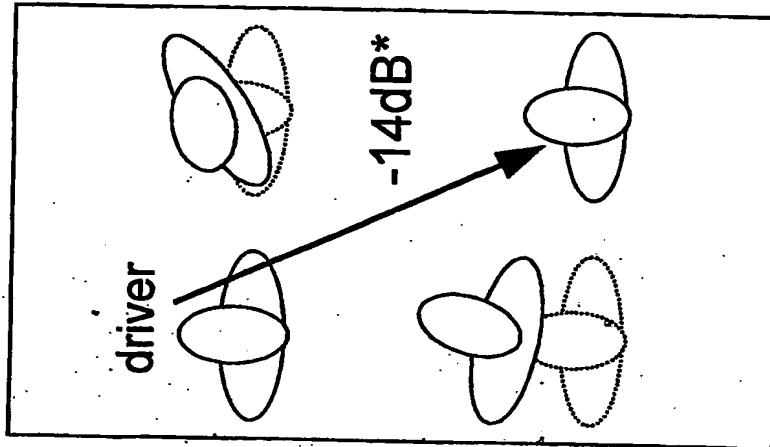
4 microphone array integrated in interior mirror



In-Car Communication System

passenger compartment

- Communication between passengers is difficult because of acoustic loss (especially front to back)
- Driver turns around – road safety is reduced
- Front passengers have to speak louder than normal – longer conversations will be tiring



Application

- In mid and high class automobiles which are already equipped with the necessary audio- and signal-processing equipment
- Vans, etc. - systems with reduced quality

*Acoustic loss
(referred to co-driver ear)

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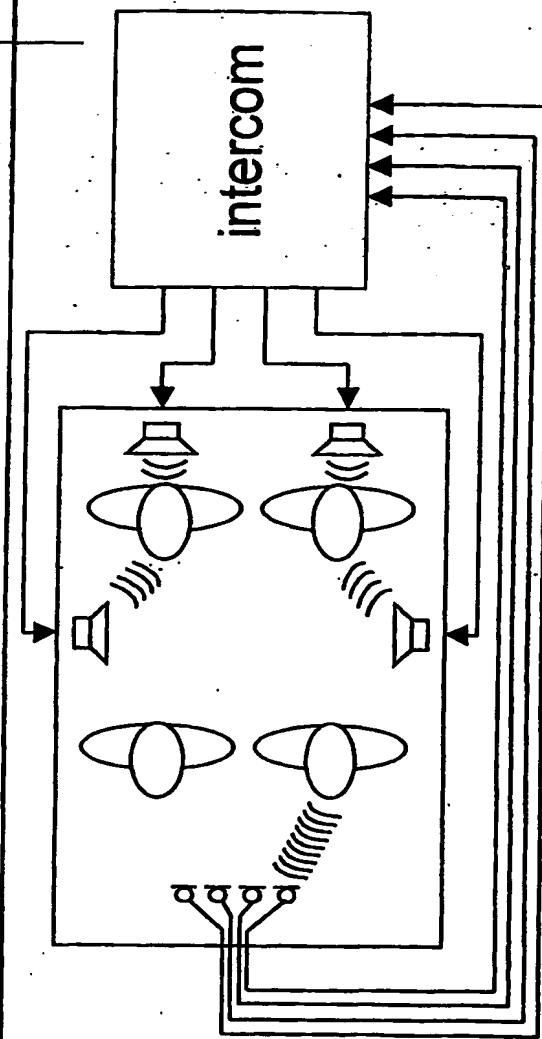
System Requirements

- The speech signal of the driver and the co-driver should be reproduced with high quality and with a minimum system delay by the rear loudspeakers. The speech signal of the passengers in the back should be reproduced by the front speakers
- The passengers should not be aware of the system
- Speaker localization should be preserved by the system
- System stability has to be guaranteed
- The in-car communication system has to be realized on existing hardware (e.g. hands-free-/ speech-dialog-system)

Implementation

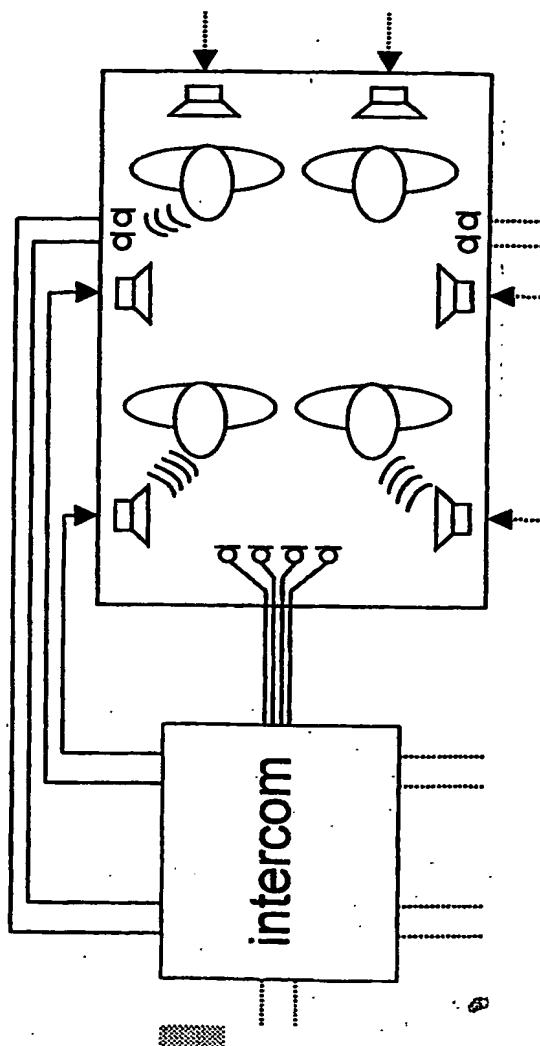
One-way system

- 2-4 microphones
- 2-4 speakers



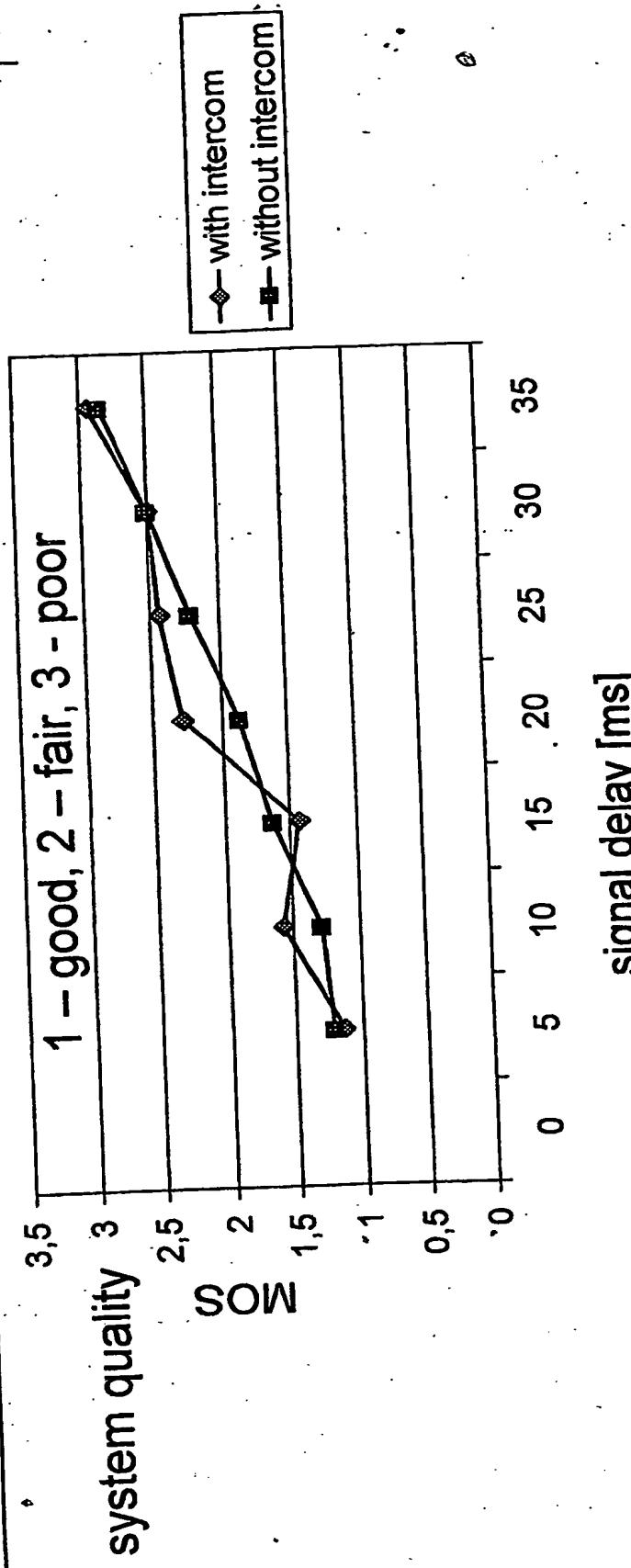
Two-way system

- 4-8 microphones
- 6-8 speakers



starrec

Signal Delay and Placement



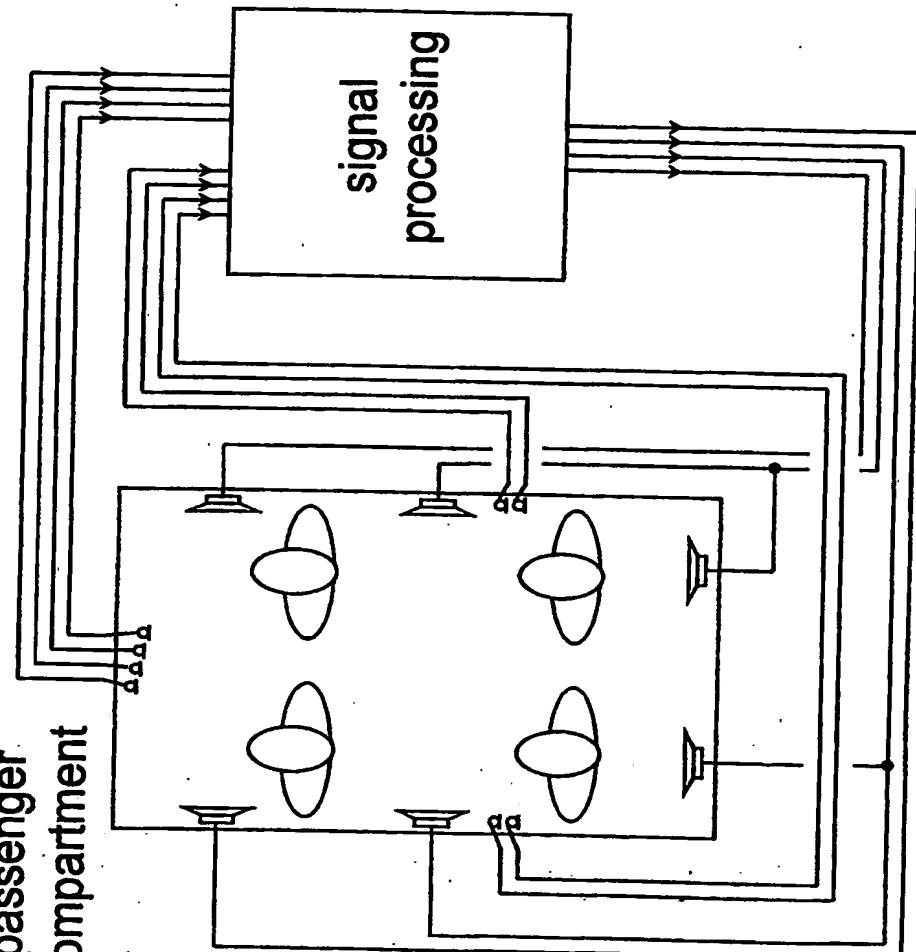
- The overall signal delay should be less than 15 ms

- To minimize the risk of feedback, the microphones and loudspeakers should be placed as close as possible to the passengers

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System Demonstrator (S-Class Mercedes)

passenger
compartment



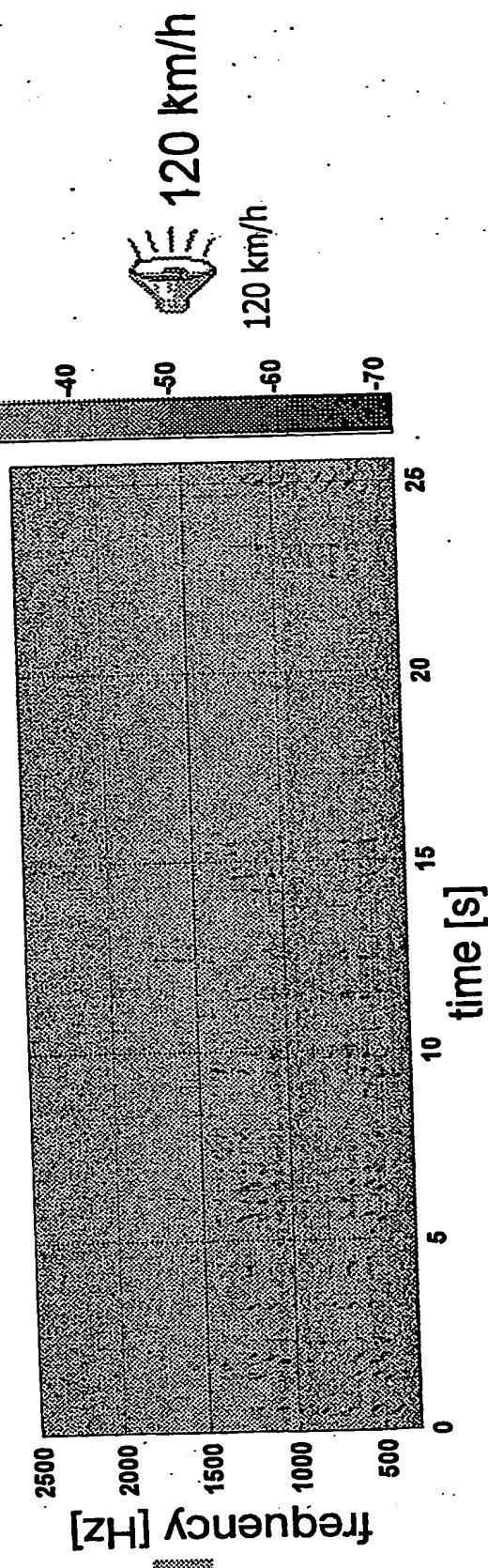
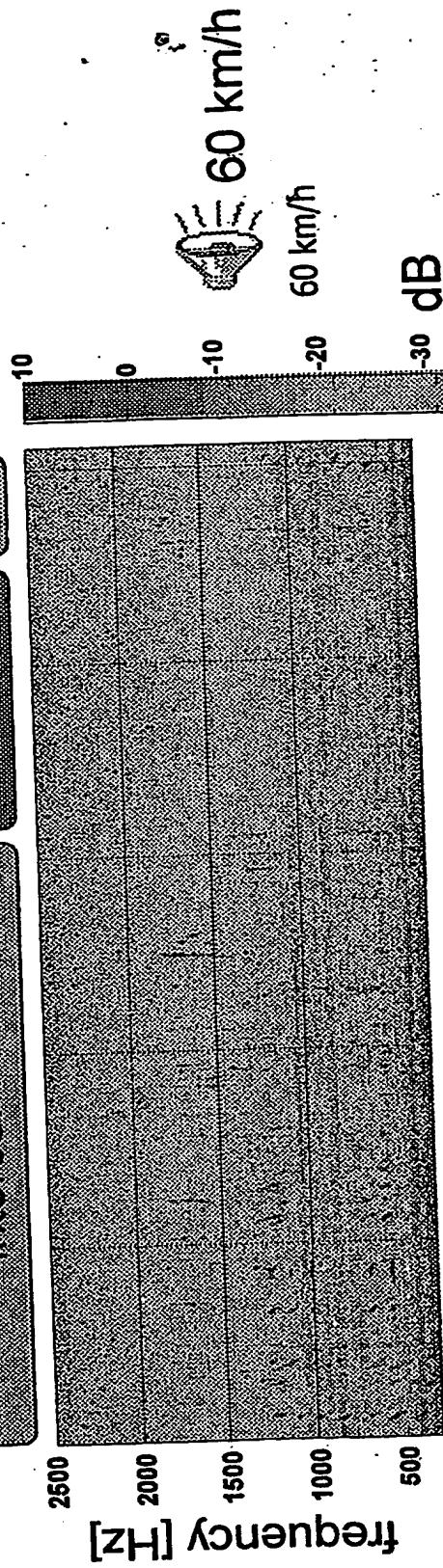
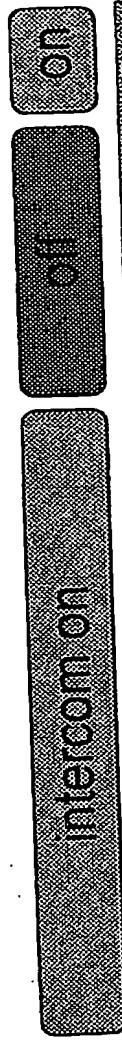
system requirements:

- 100 MHz DSP
- 4 ... 8 ADC
- 4 ... 6 DAC

system functionality:

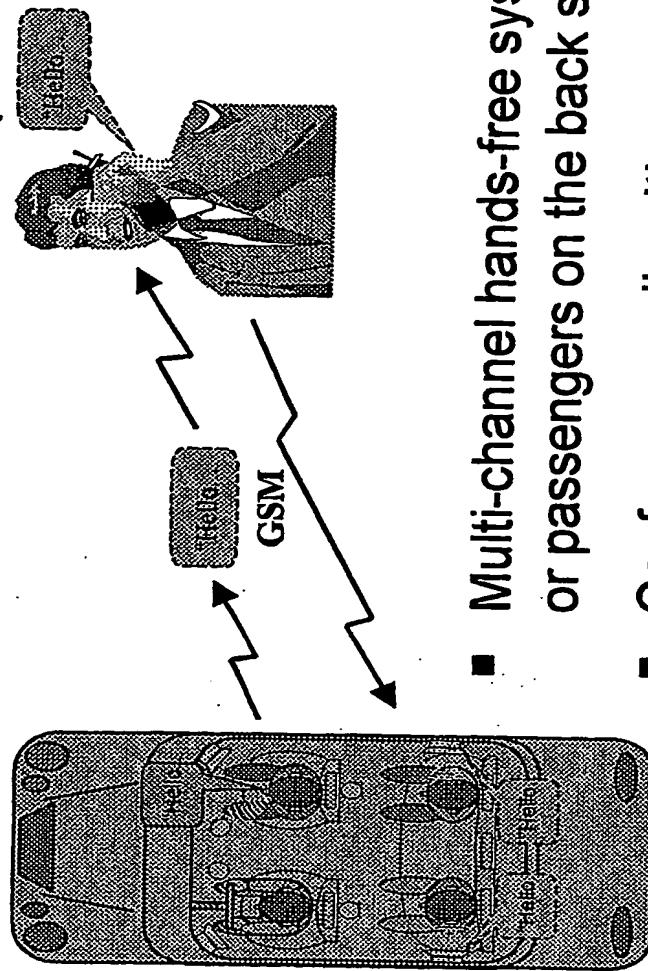
- Two-way system with feedback suppression
- System output level is controlled depending on the noise level at the microphones

Audio-Demonstration (Binaural Recording)



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Conference Calls/ In-Car Communication



- Multi-channel hands-free system for driver and co-driver or passengers on the back seats
- Conference calls with up to 4 partners with Intercom functionality from the front to the back
- Intercom functionality between passengers in the front and in the back
- Speech Processing capabilities available for all seats

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